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DINSMORE & SHOHL LLP
ONE DAYTON CENTRE, ONE SOUTH MAIN STREET
SUITE 1300
DAYTON, OH 45402-2023

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KIM, JAY C	

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/605,293
Filing Date: June 28, 2000
Appellant(s): CHAPEK, DAVID L.

Susan M. Luna
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 8, 2008 appealing from the Office action mailed September 18, 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

An appeal was filed on December 19, 2005 (Appeal No. 2006-2669), and a decision was rendered in that appeal on September 21, 2007. A copy of the decision is attached in the Related Proceedings Appendix.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

The following discussion supplements Appellant's summary so as to assist the Board in better understanding the invention and the issues on appeal.

It is important in this appeal to note that all the appealed claims are directed towards a product, or structure, and are not directed towards the method of forming or

manufacturing that structure. Thus the limitations written as to have some method associated therewith should be interpreted in light of the structure formed by that method and not limited to the method itself. In other words, these limitations should be interpreted under the well-established product-by-process doctrine. Thus, the claims do not require plasma source ion implantation be used as the process for doping the layer of silicon dioxide with hydrogen ions. It is noted that the structure of a metal contaminant is the same regardless of whether the metal contaminant was introduced by sputtering, diffusion, or any other method or if the metal contaminant was the result of contamination of the original starting substrate.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Applicant's admitted prior art, pages 1-2 of the Specification under the heading "BACKGROUND OF THE INVENTION".

5,946,585	Zhang et al.	08-1999
6,265,247	Nakanishi et al.	07-2001
5,711,998	Shufflebotham	01-1998
5,576,229	Murata et al.	11-1996

Burns et al., Principles of Electronic Circuits, pp 380-381

(9) Grounds of Rejection

The following grounds of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 9-12 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 9-12, the limitation "has reduced sputtered metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation process" renders the claim indefinite. The metes and bounds of the claim are indefinite because the ordinary artisan would not know what level of metal contaminants is required to meet the limitation. Whether or not metal contaminants are "sputtered", metal contaminants make no structural difference in the product. Further, whether or not the metal contaminants come from a Kauffman ion implantation process or another source also does not make a structural difference in the product. Considering metal contaminants can come from many different sources (including subsequent metallization processes), there is no way to determine if metal contaminants in the final product came from the Kauffman ion implantation process or another source. The level of sputtered metal contaminants resulting from a Kauffman

ion implantation process can vary due to varying process conditions such as implantation time and energy. The amount of metal contaminants from other sources may also vary depending on manufacturing techniques used to make the device. The specification provides no guidance as to the amount of metal contaminants that can be imparted when using a Kauffman ion implantation process, nor does the specification provide any guidance as to the amount of metal contaminants imparted when using the disclosed plasma source ion implantation process. Further, when looking at a final (or intermediate) product, there is no way for the ordinary artisan to determine whether or not any metal contaminants existing in the silicon dioxide layer are from a Kauffman ion implantation process, or from another source. Therefore, the ordinary artisan would not be able to determine the level of metal contaminants covered by the scope of the claim. In view of all of the above noted considerations, the limitation does not particularly point out and distinctly claim the level of metal contaminants in the product.

Regarding claim 14, the limitation "a semiconductor substrate formed from a material selected from the group consisting of silicon dioxide, quartz and glass" renders the claim indefinite. The listed materials are insulating materials. It is unclear how the substrate can be a semiconductor substrate when it is made of an insulating material.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 9 is rejected under 35 U.S.C. 102(a) as being anticipated by Applicant's admitted prior art (hereinafter the APA).

Regarding claim 9, as best the Examiner can ascertain the claimed invention, the APA anticipates the claim. The APA discloses, on page 1 lines 12-16, a semiconductor substrate, a layer of silicon dioxide on the substrate, and a layer of polycrystalline silicon formed on the layer of silicon dioxide, the layer of polycrystalline silicon having a smooth morphology. The APA discloses the layer of silicon dioxide having been doped with hydrogen ions. The APA is considered to inherently teach a substrate as the APA teaches DRAM's and DRAM's inherently have a substrate. Though the APA does not explicitly state a layer of polysilicon is on the layer of silicon dioxide, it is implicitly understood that the polysilicon is formed seeing that the APA discusses performing the hydrogen doping of the layer of silicon dioxide so as to provide a thinner, smoother polysilicon film deposited on the silicon dioxide. The APA does not explicitly state the layer of silicon dioxide "has reduced sputtered metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation process", but this limitation is inherent. The level of metal contaminants imparted by the Kauffman ion implantation process of the APA can be considered "reduced" compared

to an arbitrary ion implantation process conducted at a higher energy and/or for a longer time. Regardless of the particular parameters of the APA process, there can always be another Kauffman ion implantation process that is conducted at a higher temperature or for a longer time period. In other words, since the claim does not specify the particular conditions of the Kauffman ion implantation process, there can always be some Kauffman ion implantation process that imparts more metal contaminants than that of the APA process.

Claims 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhang et al. (US 5,946,585), as evidence by Nakanishi et al. (US 6,265,247).

Regarding claims 9 and 10, Figure 1D of Zhang discloses a semiconductor substrate (101) (col. 4, lines 14-16), a layer of silicon dioxide (104) (col. 4, lines 48-49) formed on the semiconductor substrate (101), the silicon dioxide layer inherently containing hydrogen, and a layer of polycrystalline silicon (105) (col. 4, lines 56-58) formed on the layer of silicon dioxide, the layer of polycrystalline silicon (105) having a smooth morphology (at least to some degree), and a gate oxide formed on the substrate from the layer of silicon dioxide. Zhang discloses the silicon dioxide layer (104) is formed by plasma CVD (col. 4, lines 44-46). Therefore, the layer inherently contains at least some hydrogen. Nakanishi discloses that a silicon oxide film formed by plasma CVD contains hydrogen (col. 2, lines 30-34). The limitation "having been doped with hydrogen ions deposited by a plasma source ion implantation process" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of

production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. Since no Kauffman ion implantation process is conducted during the manufacturing of the device of Zhang, it is inherent that the oxide layer has reduced sputtered metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation process.

Claim 14 is rejected under 35 U.S.C. 102(b) as being anticipated by Shufflebotham (US 5,711,998).

As best the Examiner can ascertain the claimed invention, Figure 3 of Shufflebotham discloses a thin film transistor comprising a semiconductor substrate (301) formed from glass (col. 5, lines 13-15), a layer of polycrystalline silicon (306A/307/306B) (col. 5, lines 18-20) formed on at least a portion of the semiconductor substrate, the layer of polycrystalline silicon having a smooth morphology (any layer can be considered smooth to at least some degree), a layer of an insulating material (308) formed on at least a portion of the layer of polycrystalline silicon, a gate oxide (308) (col. 5, lines 17-18) formed from the layer of insulating material, a source region and a drain region formed in the layer of polycrystalline silicon, and a gate electrode (304) formed on the insulating material. Shufflebotham discloses performing a hydrogenation process in which hydrogen ions diffuse into the polycrystalline silicon layer (see col. 6, lines 17-49, for example). In this process, it is inherent that at least some hydrogen ions reach the substrate. The limitation "implanted therein by plasma source ion

implantation" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by- process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. Note that Shufflebotham does not use a Kauffman ion implantation process. Therefore, as best the Examiner can ascertain the claimed invention, it is inherent that the substrate (301) has reduced sputtered metal contaminants in comparison with a semiconductor substrate doped with ions deposited by a Kauffman ion implantation process.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burns et al. (Principles of Electronic Circuits, pp. 380-381) in view of the APA.

Regarding claim 10, Burns et al. teach a field effect transistor in Fig. 9.8. Burns et al. teach a substrate, a silicon dioxide layer, a layer of polycrystalline silicon over the silicon dioxide layer, and a gate oxide, a source and a drain in the substrate where a gate electrode is formed from the layer of polycrystalline silicon.

Bums et al. do not teach the layer of silicon dioxide having hydrogen ions implanted therein or the silicon dioxide layer having reduced sputtered metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation process.

The APA teaches implanting hydrogen ions into silicon dioxide on page 1 lines 12-16. The APA as discussed above inherently teaches the silicon dioxide "has reduced sputter metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation process". In the combination of the references, the gate oxide would be formed from the layer of silicon dioxide having hydrogen ions implanted therein.

Burns et al. and the APA are combinable because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to implant hydrogen ions into the silicon dioxide layer. The motivation for doing so is to prepare the surface of the silicon dioxide for the deposition of a layer of polycrystalline silicon to provide for a thinner and smoother polycrystalline silicon film. Therefore, it would have been obvious to combine Burns et al. with the APA to obtain the invention of claim 10.

Regarding claim 11, Burns et al. teach on pages 380-381, a memory array which further includes a plurality of memory cells arranged in rows and columns comprising at least one field effect transistor having a gate oxide, source, and drain formed on the substrate and a gate electrode for each transistor formed of the layer of polycrystalline

silicon. The gate oxide for each transistor of the combination of references would be formed of the silicon dioxide having hydrogen atoms implanted therein.

Regarding claim 12, Official Notice is taken that one of ordinary skill in the art at the time of the invention would form the transistor of claim 10 or the memory array of claim 11 on a semiconductor wafer including a plurality of die. This is well known as in semiconductor processing multiple devices are formed on a single wafer then split into individual die to allow for processing of a great number of die at one time to save of processing costs. Also, the gate electrode is a repeating series of gate electrodes for each transistor on each die formed from the layer of polycrystalline silicon.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murata et al. (US 5,576,229) in view of the APA.

Murata et al. teach a thin film transistor (Fig. 6E) comprising a semiconductor substrate of glass, a layer of polycrystalline silicon (507) formed on a portion of the substrate, an insulating layer (503) formed on a portion of the polycrystalline silicon, a gate oxide, a source region (507a) and drain region (507b) formed in the polycrystalline silicon, and a gate electrode (504) formed on the insulating layer.

Murata et al. do not teach the substrate having hydrogen ions implanted therein or the substrate having reduced sputtered metal contaminants in comparison with a substrate doped with ions deposited by a Kauffman ion implantation process.

The APA teaches implanting hydrogen ions into a silicon dioxide (glass) layer to provide a smooth topology polycrystalline silicon film thereon on page 1 lines 12-16. The APA as discussed above inherently teaches the silicon dioxide "has reduced

sputter metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation process". Murata et al. and the APA are combinable because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implant hydrogen ions into the glass substrate. The motivation for doing so is to prepare the surface of the glass substrate for the deposition of a layer of polycrystalline silicon to provide for a thinner and smoother polycrystalline silicon film.

Therefore, it would have been obvious to combine Murata et al. with the APA to obtain the invention of claim 14.

(10) Response to Argument

Regarding the rejection of claims 9-12 and 14 under 35 USC, 112, second paragraph

The Examiner has maintained the position that the limitation "has reduced sputtered metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation process" renders the claim indefinite as "the ordinary artisan would not know what level of metal contaminants is required to meet the limitation." The reasoning behind this rejection is that the metes and bounds of the claim are indefinite because one of ordinary skill in the art would not know what level of metal contaminants is required to meet the limitation: the amount of recited “reduced sputtered metal contaminants” is compared to an amount of metal contaminants deposited by “a Kauffman ion implantation process” or a certain Kauffman ion implantation process, which would inherently depend on operating parameters of “a Kauffman ion implantation process”. In other words, a Kauffman ion implantation

process would produce a varying level of metal contaminants depending on, for example, a type of a Kauffman ion implanter, a duration of a Kauffman ion implantation process, or an energy of ions used for a Kauffman ion implantation process.

Appellant argues that "[t]here is no need to quantify or to determine the amount of metal contaminants as the claim language clearly conveys that the claimed silicon dioxide layer has fewer metal contaminants than a layer doped utilizing the Kauffman ion implantation technique". Appellant claims "reduced sputtered metal contaminants" in comparison with "a Kauffman ion implantation process", and therefore one of ordinary skill in the art cannot determine whether an amount of metal contaminants is smaller than that produced by "a Kauffman ion implantation process" without measuring the amount of metal contaminants. In other words, since Appellant does not claim specific metal contaminants and specific concentration of the metal contaminants deposited by a plasma source ion implantation process, one of ordinary skill in the art would not be able to determine whether reduced sputtered metal contaminants are deposited in comparison with a Kauffman ion implantation process, which may produce different types of metal contaminants compared to the plasma source ion implantation process.

Appellant argues that "[w]hile the Examiner asserted at page 11 of the office action that one skilled in the art cannot determine whether the amount of metal contaminants is smaller than that produced by a Kauffman ion implantation process without measuring the amount, such does not render the claim indefinite". Since Appellant does not claim specific metal contaminants and specific concentration of the metal contaminants deposited by a plasma source ion implantation process, one of

ordinary skill in the art would not be able to determine whether reduced sputtered metal contaminants are deposited in comparison with a Kauffman ion implantation process, which may produce different types of metal contaminants compared to the plasma source ion implantation process.

Appellant argues that "[t]he claimed doped silicon dioxide layer simply has a reduced level of metal contamination when compared with the known Kauffman ion technique". Even though a Kauffman ion implantation may be a known technique that produces known and measurable levels of metal contamination on the surfaces of target objects as Appellant asserts, Appellant does not claim specific operating parameters of "a Kauffman ion implantation process", and therefore one of ordinary skill in the art would not recognize an amount and types of metal contaminants.

Appellant argues "the scope of the claimed subject matter would be understood by one skilled in the art, i.e., one skilled in the art would know what is meant by "reduced sputtered metal contaminants in comparison with a semiconductor substrate doped with ions deposited by a Kauffman ion implantation process." The metes and bounds of the claim are indefinite because one of ordinary skill in the art would not know what level of metal contaminants is required to meet the limitation: the amount of recited reduced sputtered metal contaminants is compared to an amount of metal contaminants deposited by "a Kauffman ion implantation process" or a certain Kauffman ion implantation process, which would inherently depend on operating parameters of "a Kauffman ion implantation process". Further, Appellant does not claim specific metal contaminants and concentration of the metal contaminants deposited by a plasma

source ion implantation process, and therefore one of ordinary skill in the art would not be able to determine whether reduced sputtered metal contaminants are deposited in comparison with "a Kauffman ion implantation process", which may produce different types of metal contaminants compared to the plasma source ion implantation process.

Appellant argues that "Applicant's position is supported by the Board Decision on Appeal decided in this application on September 21,2007, in which the Board stated that the applicant's specification describes a process that produces a semiconductor device in which the possibility of metal contamination is reduced when compared to the prior art Kauffman ion source implantation technique". Even though the Appellant's Specification may describe a process that produces a semiconductor device in which the possibility of metal contamination is reduced when compared to the prior art Kauffman ion source implantation technique, the Appellant's Specification does not necessarily suggest that a certain plasma source ion implantation process would produce reduced sputtered metal contaminants in comparison with any arbitrary Kauffman ion implantation process.

For these reasons, claim 9 is not in compliance with 35 USC 112, second paragraph.

Rejections of appealed claims 10-12 and 14 under 35 USC 112, second paragraph, are maintained for the same reasons stated above with regard to claim 9.

Appellant argues that "[t]he specification clearly defines a semiconductor substrate as a substrate which is part of a semiconductor device, i.e., a substrate which forms a semiconductor device". When there is more than one definition for a term, it is

incumbent upon applicant to make clear which definition is being relied upon to claim the invention, and until the meaning of a term or phrase used in a claim is clear, a rejection under 35 USC 112, second paragraph is appropriate. See MPEP 2173.05(a) III. A semiconductor substrate commonly refers to a substrate formed of a semiconductor material, and Appellant uses a term "a semiconductor substrate" as a substrate which forms a semiconductor device regardless of the material. Appellant does not make clear which definition of "a semiconductor substrate" is being relied upon in claim 14.

For these reasons, claim 14 is indefinite and is not in compliance with 35 USC 112, second paragraph.

Regarding the rejection of claim 9 under 35 USC 102(a) as being anticipated by "Applicant's admitted prior art" (APA)

Appellant argues that "Applicant previously pointed out that claim 9 does not refer to an "arbitrary" implantation process, but refers specifically to the comparison of a silicon dioxide layer deposited with ions by a plasma ion source implantation process with that of the (same) silicon dioxide layer deposited with ions by a Kauffman ion implantation process". Appellant does not claim specific operating parameters of "a Kauffman ion implantation process", and therefore one Kauffman ion implantation process would inherently produce reduced sputtered metal contaminants in comparison with another Kauffman ion implantation process. The Examiner has provided a basis in fact and/or technical reasoning to reasonably support the determination that the

allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.

Appellant argues that “[h]ence, the claimed comparison cannot be inherent in the "APA." As stated above, one Kauffman ion implantation process would inherently produce reduced sputtered metal contaminants in comparison with another Kauffman ion implantation process. Further, Appellant does not claim reduced sputtered metal contaminants in comparison to any possible Kauffman ion implantation process.

Appellant argues that “as the "APA" *describes* a Kauffman ion implantation process, that process cannot result in reduced sputtered metal contaminants in comparison to itself”. Since Appellant does not claim specific operating parameters of “a Kauffman ion implantation process”, a Kauffman ion implantation process can result in reduced sputtered metal contaminants in comparison to another.

Appellant argues that “[s]uch an assertion is speculative and ignores the explicit language of the claim”. The Examiner's position is not speculative, because, for example, a longer period of a Kauffman ion implantation process would inherently produce more sputtered metal contaminants than a shorter period of a Kauffman ion implantation process with the other operating parameters remaining the same, because metal grids would be bombarded by more ions.

Appellant argues that “[t]he Examiner's speculation provides no factual basis for his reasoning, i.e., the Examiner has provided no evidence that using a Kauffman ion implantation process in one instance would provide reduced sputtered metal contaminants when using the same process in another instance”. The Examiner did not

compare the two same processes to reject claim 9. Rather, as clearly stated above, one Kauffman ion implantation process would inherently produce reduced sputtered metal contaminants in comparison with another Kauffman ion implantation process.

Appellant argues that "such speculation ignores that the claim recites a hydrogen ion doped silicon dioxide layer, the ions deposited by a plasma source ion implantation process". The limitation "having been doped with hydrogen ions deposited by a plasma source ion implantation process" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966.

For these reasons, claim 9 is anticipated by the "APA."

Regarding the rejection of claims 9 and 10 under 35 USC 102(b) as anticipated by Zhang et al. as evidenced by Nakanishi et al.

Appellant argues that "Zhang et al. do not teach a layer of silicon dioxide the surface of which is doped with hydrogen ions deposited by a plasma source implantation process as claimed, so it is irrelevant whether or not Zhang's plasma CVD process would produce greater or lesser levels of metal contamination than a Kauffman ion implantation process". As stated above, the claimed limitation "having been doped with hydrogen ions deposited by a plasma source ion implantation process" is a

product-by-process limitation which does not structurally distinguish the claimed invention over the prior art.

Appellant argues that “Zhang simply does not teach, expressly or inherently, a semiconductor device having a layer of silicon dioxide thereon, with the surface of that layer doped with hydrogen ions”. Nakanishi et al. reference was used to show that it is inherent that the layer of silicon dioxide formed by plasma CVD disclosed by Zhang et al. comprises hydrogen ions.

Appellant argues that “[t]here is no teaching or suggestion in either Zhang et al. or Nakanishi et al. of a layer of silicon dioxide the surface of which is doped with hydrogen ions deposited by a plasma source implantation process”, and that “[r]ather, Zhang et al. teach formation of a silicon oxynitride film by plasma CVD (coll. 4, lines 44-45)”. As stated above, the claimed limitation "having been doped with hydrogen ions deposited by a plasma source ion implantation process" is a product-by-process limitation which does not structurally distinguish the claimed invention over the prior art, since Zhang et al. as evidenced by Nakanishi et al. comprises hydrogen ions in the silicon dioxide layer.

Appellant argues that “what Nakanishi et al. actually teach at column 2, lines 30-34, is that the hydrogen ion concentration of silicon *nitride* films formed by plasma CVD is higher than the hydrogen ion concentration of silicon *oxide* films formed by the same plasma CVD method”, and that “[t]his does not constitute a teaching of a layer of silicon dioxide the surface of which is doped with hydrogen ions by a plasma source ion implantation process as claimed”. Nakanishi et al. clearly disclose a hydrogen ion

concentration of $10^{20}/cm^3$ for a layer of silicon oxide formed by plasma CVD (col. 2, lines 30-34). Further, the claimed limitation "having been doped with hydrogen ions deposited by a plasma source ion implantation process" is a product-by-process limitation which does not structurally distinguish the claimed invention over the prior art.

Appellant argues that "[n]or would one conclude from reading Zhang or Nakanishi et al. that a doped layer of silicon dioxide as claimed would have a reduced level of sputtered metal contaminants when compared with a layer of silicon dioxide doped with hydrogen ions deposited by a Kauffman ion implantation process". Since no Kauffman ion implantation process is conducted during the manufacturing of the device of Zhang et al., it is inherent that the silicon dioxide layer disclosed by Zhang et al. as evidenced by Nakanishi et al. has reduced sputtered metal contaminants in comparison with a silicon dioxide doped with ions deposited by "a Kauffman ion implantation process".

Appellant argues that "[t]he Examiner has failed to provide the required factual basis for anticipation". For the reasons stated above, Zhang et al. as evidenced by Nakanishi et al. anticipate claim 9.

Appellant argues that "there is no teaching or evidence that if hydrogen ions existed in layer 104 of Zhang, such ions would be located in the surface of such a layer as claimed". Since Zhang et al. disclose that the silicon dioxide layer 104 is formed by plasma CVD and Nakanishi et al. disclose that a silicon oxide layer formed by plasma CVD contains hydrogen ions, a surface of the silicon dioxide layer 104 disclosed by Zhang et al. inherently is doped with hydrogen ions.

Appellant argues that “[w]hile the Examiner asserts at page 13 that the surface would be inherently doped with hydrogen ions "because the hydrogen ions are substantially uniformly distributed in the layer of silicon dioxide," he has provided no evidence or reasoning to support his speculation”. Zhang et al. disclose forming a silicon dioxide layer 104 using a plasma CVD, and therefore hydrogen ions would be substantially uniformly distributed in the layer of silicon dioxide, because Zhang et al. implicitly disclose that the whole silicon dioxide layer 104 would be formed in a single process.

Appellant argues that “[w]hile Zhang may suggest alternative compounds for use in layers 104 and 105, those alternatives are not preferred”. Zhang et al. do not disclose that only silicon oxynitride is preferred and those alternatives are not preferred.

Appellant argues that “in any event, one skilled in the art reading Zhang would be required to ignore Zhang's stated preferences, and to pick and choose among Zhang's possible alternatives, to arrive at the claimed device”. Zhang et al. do not disclose that only silicon oxynitride is preferred and those alternatives are not preferred.

Appellant argues that “[s]uch a requirement for picking and choosing defeats any rejection for anticipation under §102”. Zhang et al. do not disclose that only silicon oxynitride is preferred and those alternatives are not preferred.

Claim 10 is not patentable as anticipated by Zhang et al. as evidenced by Nakanishi et al. for the same reasons discussed above with respect to claim 9.

Appellant argues that “[w]hile the Examiner asserted at page 5 of the Office Action that Zhang shows "a gate oxide formed on the substrate from the layer of silicon

dioxide," he failed to identify where in Fig. 1 of Zhang such a "gate oxide" was located". A portion of the silicon dioxide layer 104 or the whole silicon dioxide layer 104 may be referred to as a gate oxide, because Appellant does not claim a specific structure and function of the gate oxide.

Appellant argues that "[t]hat is because there is no gate oxide". See the above response.

Appellant argues that "[n]owhere does Zhang teach such a gate oxide in the location recited in claim 10". See the above response.

For these reasons, Zhang et al. as evidenced by Nakanishi et al. anticipate claim 10.

Regarding the rejection of claim 14 under 35 USC 102(b) as being anticipated by Shufflebotham

Appellant argues that "Applicant submits that claim 14 is patentable over Shufflebotham for the same reasons discussed above with regard to claim 9, namely that there is no teaching or suggestion in Shufflebotham of a layer of silicon dioxide the surface of which has been doped with hydrogen ions deposited by a plasma source implantation process", and that "[r]ather, Shufflebotham teaches a method of hydrogenating polysilicon in an electrical device using a radio frequency high density plasma reactor". As stated with regard to claim 9 above, the limitation "having hydrogen ions implanted therein by plasma source ion implantation" does not structurally distinguish the claimed invention over the prior art.

Appellant argues "[n]owhere does Shufflebotham describe a surface-doped semiconductor substrate layer as recited in claim 14". Shufflebotham discloses performing a hydrogenation process in which hydrogen ions diffuse into the polycrystalline silicon layer (see col. 6, lines 17-49, for example), wherein the chuck (362 in Fig. 4 of Shufflebotham) and the substrate (360) act as a negatively charged electrode (Shufflebotham, col. 6, lines 38-40) and hydrogen ions reach a layer of polycrystalline silicon (306A/307/306B) (Shufflebotham, col. 6, lines 46-49). In this process, it is inherent that at least some hydrogen ions reach the substrate while migrating toward the chuck (362). The Examiner has provided a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.

Appellant argues that "[w]hile the Examiner has asserted that "at least some" hydrogen ions would inherently reach substrate 301 in Shufflebotham, he has provided no evidence to support such an assertion", that "proof of inherency requires proof that the asserted action will always and necessarily take place", and that "[t]he Examiner has not carried his evidentiary burden of proving inherency here". As stated above, Shufflebotham discloses performing a hydrogenation process, wherein the chuck (362) and the substrate (360) act as a negatively charged electrode and hydrogen ions reach a layer of polycrystalline silicon (306A/307/306B). In this process, it is inherent that at least some hydrogen ions reach the substrate while migrating toward the chuck (362). The Examiner has provided a basis in fact and/or technical reasoning to reasonably

support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.

For these reasons, claim 14 is anticipated by Shufflebotham.

Regarding the rejection of claims 10-12 under 35 USC 103(a) over Burns et al. (Principles of Electronic Circuits, pp. 380-381) in view of "Applicant's admitted prior art (APA)"

Appellant argues that "[h]owever, how can something that is not taught by either reference be "inherent"?", and that "[t]he answer is that it cannot". The Examiner did not state that "the claimed layer of silicon dioxide having hydrogen ions implanted therein having reduced sputtered metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by a Kauffman ion implantation technique" is inherent. The Examiner used APA as a secondary reference to show that the silicon dioxide layer disclosed by Burns may have hydrogen ions implanted by a Kauffman ion implantation process, and APA inherently teaches the silicon dioxide has reduced sputter metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by "a Kauffman ion implantation process" due to the reasons stated above with regard to claim 9.

Appellant argues that "[a]s discussed above with regard to claim 9, the APA does not teach that a silicon dioxide layer deposited with ions by a plasma ion source implantation process compared with that of the (same) silicon dioxide layer deposited with ions by a Kauffman ion implantation process would have reduced metal contaminants". Appellant does not claim specific operating parameters of "a Kauffman

ion implantation process", and therefore one Kauffman ion implantation process would inherently produce reduced sputtered metal contaminants in comparison with another Kauffman ion implantation process. The Examiner has provided a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.

For the reasons stated above, claim 10 is not patentable over Burns et al. in view of APA.

Claims 11 and 12 are not patentable for the same reasons discussed above with regard to claim 10.

Regarding the rejection of claim 14 under 35 USC 103(a) over Murata et al. in view of "Applicant's admitted prior art (APA)"

Appellant argues that "[a]s pointed out above with regard to claim 9, how can something that is not taught by either reference be "inherent"?", and that "[t]he answer is that it cannot". The Examiner did not state that "the claimed layer of silicon dioxide having hydrogen ions implanted therein" is inherent. The Examiner used APA as a secondary reference to show that the silicon dioxide layer disclosed by Murata et al. may have hydrogen ions implanted by a Kauffman ion implantation process, and APA inherently teaches the silicon dioxide has reduced sputter metal contaminants in comparison with a layer of silicon dioxide doped with ions deposited by "a Kauffman ion implantation process" due to the reasons stated above.

Appellant argues that "[t]he APA does not teach that a silicon dioxide layer deposited with ions by a plasma ion source implantation process compared with that of

the (same) silicon dioxide layer deposited with ions by a Kauffman ion implantation process would have reduced metal contaminants". Appellant does not claim specific operating parameters of "a Kauffman ion implantation process", and therefore one Kauffman ion implantation process would inherently produce reduced sputtered metal contaminants in comparison with another Kauffman ion implantation process. The Examiner has provided a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.

For these reasons, the combined teachings of Murata et al. and the "APA" would render claim 14 obvious.

(11) Related Proceeding(s) Appendix

A copy of the Board decision identified in the Related Appeals and Interferences section of this examiner's answer is provided along with the Appeal Brief filed December 8, 2008.

For the reasons above, it is believed that the rejections should be sustained.

Respectfully submitted.

Jay C. Kim

/Jay C Kim/

Examiner, Art Unit 2815

/Kenneth A Parker/

Supervisory Patent Examiner, Art Unit 2815

Conferees:

Tom Thomas

/T. T./

Supervisory Patent Examiner, Art Unit 2800

Ken Allen Parker

/K. A. P./

Supervisory Patent Examiner, Art Unit 2815